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6. AUTHOR(S)
Professor John M.J. Madey

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
Duke University
Office of Research Support
01 Allen Building
Durham, NC 27706

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Research during this period has resulted in (1) the development of an "active" magnetic shielding system to reduce the non-linear interactions between adjacent dipole and sextupole magnets in the Duke FEL storage ring, and (2) the development of an electromagnetic undulator with variable period to provide extended tuning range.

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The principal milestones scheduled for this period were:

1. The completion of the modification to the components of the 1 GeV FEL Storage Ring.

2. The completion of a test section of ultraviolet undulator for the FEL ring.

The status of these tasks is summarized below:

Modifications to ring components:

A number of approaches have been evaluated to reduce the effects o magnetic saturation in the sextupole magnets required to correct chromaticity. The most effective approach has required (A) an increase in the thickness of the yoke of the sextupole magnet, (B) the installation of a pair of samarium-cobalt blocks between the upper and lower poles of the dipole magnet and the sextupole magnet, and (C) the installation of vanadium-permendur "field leveling plates" on the upper and lower poles of the dipole magnets. These modifications have substantially reduced the effects of magnetic saturation.

Detailed tests have continued through the conclusion of this period to evaluate the effects of these modifications on ring operation.

Undulator test section:

A six-pole test section of a "programmable undulator" has been fabricated. The test section uses soft-iron core excited by a pair of water-cooled copper windings to achieve and on-axial field in excess of 6 kilogauss with a 10mm gap and period which can be changed from 25 to 75mm by changing the direction of the current through the copper coils. The ability to change the period of undulator will allow the coverage of the broad wavelength region between 50 and 5000 angstroms.

Detailed tests of the undulator test section will be continued through the end of the reporting period.